Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

Integrating $(D+1)y=e^{\frac{1}{2}x}(A\cos\frac{\sqrt{3}}{2}x+B\sin\frac{\sqrt{3}}{2}x)$......(3).

Differentiating this with respect to x,

$$\frac{d^2y}{dx^2}+\frac{dy}{dx}=e^{\frac{1}{2}x}[(\tfrac{1}{2}\cos\frac{\sqrt{3}}{2}x-\frac{\sqrt{3}}{2}\sin\frac{\sqrt{3}}{2}x)A$$

$$+(\tfrac{1}{2}\sin\frac{\sqrt{3}}{2}x+\frac{\sqrt{3}}{2}\cos\frac{\sqrt{3}}{2}x)B]......(4).$$

When $x=0$, $y=1$, $dy/dx=1$, and (3) gives $A=2$.
When $x=0$, $D=1$, $D^2=0$, and (4) gives $B=0$.
$\therefore$ (3) is $(D+1)y=2e^{\frac{1}{2}x}\cos\frac{\sqrt{3}}{2}x$......(5).

Integrating (5), and noticing that when $x=0$, and $y=1$, the constant of integration is nought,

$$y=e^{\frac{1}{2}x}(\tfrac{1}{3}\sqrt{3}\sin\frac{\sqrt{3}}{2}x+\cos\frac{\sqrt{3}}{2}x)......(6).$$

Also solved by *G. B. M. ZERR* and *J. SCHEFFER*.

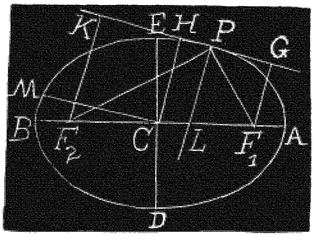
MECHANICS.

128. Proposed by M. E. GRABER, A. B., Heidelberg University, Tiffin, Ohio.

A particle is placed on the convex side of a smooth ellipse and is acted upon by two forces, F and F', towards the foci, and a force, F'', towards the center. Find the position of equilibrium.

Solution by G. B. M. ZERR, A. M., Ph. D., The Temple College, Philadelphia, Pa.; and the PROPOSER.

Let C be the center of the ellipse, semi-axes a, b; F_1, F_2, the foci; force $PF_1=F$, $PF_2=F'$, $PC=F''$; distance $PC=r$. Let fall the perpendiculars F_1G, CH, F_2K from the foci F_1, F_2, and the center C on the tangent at P.



Let $\angle PF_1G=\angle PF_2K=\theta$, $\angle PCH=\varphi$.
Then $F\sin\theta=F'\sin\theta+F''\sin\varphi$.

$\therefore \dfrac{\sin\varphi}{\sin\theta}=\dfrac{F-F'}{F''}=n$, suppose.

$F_2K=F_2P\cos\theta$, $F_1G=F_1P\cos\theta$, $CH=r\cos\varphi$.
$2CH=F_2K+F_1G=(F_2P+F_1P)\cos\theta=2a\cos\theta$.
$\therefore r\cos\varphi=a\cos\theta$.
$F_2K.F_1G=b^2=F_2P.F_1P\cos^2\theta=CM^2\cos^2\theta=(a^2+b^2-r^2)\cos^2\theta$.

$$\therefore \cos\theta=\frac{b}{\sqrt{(a^2+b^2-r^2)}},\ \sin\theta=\frac{\sqrt{(a^2-r^2)}}{\sqrt{(a^2+b^2-r^2)}}.$$

$$\therefore \cos\varphi=\frac{ab}{r\sqrt{(a^2+b^2-r^2)}},\ \sin\varphi=\frac{\sqrt{[r^2(a^2+b^2-r^3)-a^2b^2]}}{r\sqrt{(a^2+b^2-r^2)}}.$$

$$\therefore\ n=\frac{\sqrt{[r^2(a^2+b^2-r^2)-a^2b^2]}}{r\sqrt{(a^2-r^2)}}=\frac{\sqrt{(r^2-b^2)}}{r}.$$

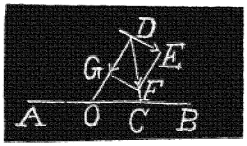
$$\therefore\ r^2-b^2=r^2n^2,\text{ or } r=\frac{b}{\sqrt{(1-n^2)}}.$$

129. Proposed by B. F. FINKEL, A. M., M. Sc., Professor of Mathematics and Physics in Drury College, Springfield, Mo.

Two spheres whose masses are M_1 and M_2 are a units apart, and attract each other with a force $=M_1M_2/a_2$. Find work done in carrying a unit mass from the center point between them a distance r in a direction θ with line of centers.

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics in The Temple College, Philadelphia, Pa.

Let $B=m_1$, $A=m_2$, $m_1>m_2$; C, the centroid of m_1, m_2; $OC=c$, $OD=x$, $DC=y$, $\angle DOC=\theta$, $\angle OCD=\varphi$.



Then $y=\sqrt{(c^2+x^2-2cx\cos\theta)}$, $c=\dfrac{a(m_1-m_2)}{2(m_1+m_2)}$.

$c=y\cos\varphi+x\cos\theta$. $\therefore\ \cos\varphi=\dfrac{c-x\cos\theta}{y}$.

Force acting on $D=(m_1+m_2)/y^2$.

Resolving this force, the component along OD

$$=(m_1+m_2)\cos(\theta+\varphi)/y_2=\frac{m_1+m_2}{y^3}\{(c-x\text{sos}\theta)\cos\theta-\sin\theta\sqrt{[y^2-(c-x\cos\theta)^2]}\}$$

$$=-\frac{(m_1+m_2)(c\cos\theta-x)}{(c^2+x^2-2cx\cos\theta)^{\frac{3}{2}}}.$$

$$\text{Work}=(m_1+m_2)\int_0^r\frac{(c\cos\theta-x)dx}{(c^2+x^2-2cx\cos\theta)^{\frac{3}{2}}}$$

$$=(m_1+m_2)\left(\frac{1}{\sqrt{(c^2+r^2-2cr\cos\theta)}}-\frac{1}{c}\right)$$

$$=2(m_1+m_2)^2\left(\frac{1}{\sqrt{4r^2(m_1+m_2)^2+a^2(m_1-m_2)^2-4ar(m_1^2-m_2^2)\cos\theta}}\right.$$

$$\left.-\frac{1}{m_1-m_2}\right).$$